B SUSTAINABLE DESIGN IN STATE PARK MASTER PLANNING

Overview

The N.C. Department of Environment and Natural Resources' Green Building Policy, drafted by the N.C. Department of Environment and Natural Resources Sustainability Team and signed by former Secretary Bill Ross, directs the department and its divisions "to take real and permanent steps to integrate sustainable and green building practices for projects in capital construction, facility renovations, facility leasing, land development, landscaping and facility purchases." All components of the master plan have been evaluated and designed based on principles of sustainable design/green design with reference to the Leadership in Energy and Environmental Design (LEED®) design criteria. LEED® is a rating system for green design first developed in 1999 by the U.S. Green Building Council. According to the U.S. Green Building Council, "Green design not only makes a positive impact on public health and the environment, it also reduces operating costs, enhances building and organizational marketability, potentially increases occupant productivity, and helps create a sustainable community" *(U.S. Green Building Council, 2005)*.

Though a project does not have to be rated through the LEED® system to be considered 'green,' the system provides a well-defined baseline from which to begin conversations in design regarding how to develop any new construction project or major renovation in a manner that will be sustainable. The N.C. Division of Parks and Recreation staff directive states, "The Division is to pursue LEED® certification through the U.S. Green Building Council's LEED® Green Building Rating System for all new, or significantly renovated, buildings having 5,000 square feet or more. For buildings less than 5,000 square feet, project team members are to be familiar with the use of LEED® as a tool to help guide the project."

Much of the LEED® system is focused on structures and will be addressed more thoroughly at later design and development phases for buildings. LEED® accreditation is based on six areas of sustainability. These include sustainable site, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation and design process. Further description of these areas in the context of Chimney Rock State Park follows.

Sustainable Site

For this master plan, specific attention has been focused on selection of sustainable sites for future development. Site selection for buildings and parking areas has been based on areas with the following qualities:

- Slopes less than 10 percent
- Areas more than 50 feet from a water body (construction should not take place within a 100 feet buffer from perennial streams whenever practicable)
- Areas more than 100 feet from a wetland as defined by the National Wetlands Inventory*
- Land that is specifically identified as habitat for any species on Federal or State threatened or endangered lists.

Other focus areas for sustainable sites include using low impact design strategies:

- Reduce imperviousness
- Conserve natural resources and ecosystems
- Maintain natural drainage courses
- Reduce use of pipes for stormwater management
- Minimize clearing and grading
- Minimize soil erosion, waterway sedimentation, and airborne particulate/dust generation during construction
- Disperse stormwater management facilities/structures uniformly across a site
- Mimic natural systems for stormwater quality control
- Minimize heat island effects
- Minimize light pollution.

During the design and construction phases of any project in the park, special attention will be focused on protecting the site from sedimentation, soil erosion, as well as airborne particulate/dust generation during the construction process. Use of best available technology for sedimentation and erosion control is critical.

Devices and structures used for sedimentation and erosion control will be maintained in good working condition at all times during construction.

Appropriate design for stormwater is important in maintaining a sustainable site. Not only should stormwater design meet state and local codes, it should go beyond these regulations to ensure stormwater quality as the water re-enters the surface and subsurface water cycles. Water quantity controls will minimize the potential for downstream flooding and erosion from site development in the future. Water quality controls, performed by structures such as bioretention areas, will help to maximize sequestration of pollutants to the site of creation as well as protecting areas downstream from these pollutants. All stormwater should flow through a vegetated upland prior to entering a stream or wetland *(N.C. Wildlife Resources Commission, 2002)*.

During construction, all equipment will be kept out of streams as much as practicable. Also, utility lines and infrastructure will be installed outside of stream buffers.

The heat island effect is defined by the U.S. Green Building Council as "thermal gradient differences between developed and undeveloped areas" *(U.S. Green Building Council, 2005)*. This effect can have negative impact on microclimates as well as human, animal, and plant habitats. Heat islands are most often caused by large areas of unshaded pavement and large roof areas. The master plan begins to address this issue through identification of overflow parking areas that use pervious and plantable materials.

Additional attention can be focused on this issue in design and construction phases of a development project through, for example, provision of ample shade in parking areas, use of high reflectance materials for paving (selected with attention to potential glare issues for those with visual disabilities), minimization of structure footprints and therefore roof areas, use of roofing materials with a high reflectance, and/or use of a vegetated roof.

Water Efficiency

Efficient use of water will be considered in every phase of a project for both the site and the buildings. Use of innovative wastewater technologies when possible and water use reduction, through the use of low-flow toilets, showers and other means, also are considered sustainable design practices. Use of cisterns to harvest rainwater from roof structures can provide water for uses including, but not limited to, landscape irrigation and toilet flushing. During the design phase of any project at the park, sustainable design principles will dictate design of water efficient landscaping, with an ideal focus toward landscaping requiring no potable water use and no irrigation beyond plant establishment.

Energy Efficiency

Green building practices cost less to operate and maintain. They also provide an opportunity to use natural resources efficiently and responsibly and to reduce the site and building's overall impact on the environment.

Buildings should be optimized for energy-efficiency, including siting buildings with an east-west axis, where practicable, to optimize for passive solar design and the use of broad roof overhangs to block mid-day summer sun.

Use of on-site renewable energy sources where possible, including opportunities for solar energy, hydropower, and/or wind power, will make the development more self-sufficient and reduce economic and environmental impacts from fossil fuel use. Energy- efficient heating and cooling systems, such as geothermal/ground source wells, use the constant earth temperature to heat and cool the workplace.

The visitor center, park administration offices, day use area structures, and any other park buildings will be designed for energy efficiency. Solar energy or other renewable energy options both for heating water and providing electricity will be explored whenever
possible.

Another means of ensuring energy-efficiency as defined by LEED® includes increasing energy performance and commissioning of buildings to ensure that systems are designed and perform in an energy-efficient manner.

Materials and Resources

Sustainable design and construction ensures waste reduction through the design of the building and the construction process. When waste is produced, recycling should be a priority. Reuse of existing building material also should be prioritized.

Design for use of new building materials in the construction process should focus on those materials utilizing recycled content. When recycled content is not possible, products made from rapidly renewable products are desirable and resource friendly. Wood certified using the Forest Stewardship Council's Principles and Criteria will promote sustainable forestry practices.

Ideally, materials will be sourced from producers and manufacturers in the surrounding region. A focus on indigenous materials can replicate a 'local vernacular' as well as minimize environmental impacts from transportation and add to local economic prosperity.

Indoor Environmental Quality

A focus on indoor air quality enhances the health and experience of building occupants. Many aspects of sustainable indoor air quality performance can be addressed by a qualified designer, such as adequate ventilation and use of low-emitting material selection (e.g. paints, sealants, adhesives, etc.).

Indoor environmental quality also addresses issues related to lighting controls, thermal comfort, daylighting, and views.

Innovation and Design Process

Sustainable design practitioners can be precedent setters for new, innovative practices in design and construction of sites and buildings. The N.C. Division of Parks and Recreation can set guidelines for all new construction at Chimney Rock State Park based on successes displayed and monitored in other projects. The visitor center building proposed in this master plan will provide opportunities for educating the general public and other designers about the ecological, cultural, and economic benefits of green design and construction.

Technologies of Particular Interest

The N.C. Division of Parks and Recreation staff directive on sustainable and green building practices indicates a particular interest in sustainable and green building technologies that address the following:

- Ecological site design; on-site erosion control, water purification/pollution reduction, and stormwater management.
- Transportation; promoting bicycle, pedestrian, and transit use where possible.
- Waste reduction; building reuse, job site recycling, and efficient use of materials.
- On-site management of sewage and organic wastes, such as graywater systems and biological wastewater treatment. It is recommended that when the existing wastewater treatment facility at the park reaches the end of its useful life, that a more innovative system, potentially using small constructed wetland systems be considered. This could provide a significant addition to the environmental education program as well.
- Energy efficiency; efficient thermal envelopes, efficient space and water heating, lighting, controls and monitoring, and appliances.
- Renewable energy; photovoltaics, geothermal pumps, wind turbines.
- Water efficiency, both domestic and irrigation, including rainwater harvesting for irrigation and toilet flushing. Consider waterless urinals in all applications.
- Materials and resources; durable building envelopes and long-lived materials or assemblies, recycled-content materials, safer, less toxic materials, such as alternatives to CCA-treated wood, innovative application of natural materials (characterized by low embodied energy, local availability, good performance, biodegradable, safe, esthetic) such as straw, earth, and other composites.
- Indoor environmental quality; pollution reduction, worker and occupant safety, air cleaning, humidity control, and thermal comfort.
- Operations and maintenance; monitoring energy, water, waste, air quality, and transportation use along with resource-efficient operation practices.

** Further design and development will require evaluation for wetlands based on 40 CFR Parts 230-233 and Part 22.*